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ABSTRACT

This paper compares the characteristics of dot-matrix and daisy wheel printers using a two-column format. In the first section, the left column is used to point out the advantages of dot-matrix printers, while the daisy wheel printer is praised in the right-hand column. Examples of various capabilities are included. Advantages of the dot-matrix printer mentioned are its simplicity, ability to produce horizontally-emphasized and vertically-emphasized print, low cost, speed and convenience of printing, ease and low cost of replacing the entire printing mechanism, convenience of operation, ease of changing print styles and sizes, and ability to define characters. For the daisy-wheel printer, advantages listed include the capability of having margin justification, an almost "typeset" look, and its elegant and sophisticated type styles and appearance. The following type styles are used for purposes of illustration: Gothic 15; standard 12-pitch elite; and normal 10-pitch pica font. A final summary discusses both types of printers. Twelve guidelines for the use of dot-matrix printers in the preparation of dissertations and theses at the College of Education, New Mexico State University, are included. (LMM)

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THE
BATTLE
OF THE PRINTERS

BY

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A Paper Presented at the Annual Conference of the
ROCKY MOUNTAIN EDUCATIONAL RESEARCH ASSOCIATION

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"PERMISSION TO REPRODUCE THIS
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THE "BATTLE" OF THE PRINTERS

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As you can see by the title, this paper was to have been a "battle" of the printers. I was to outline the advantages of the dot-matrix printer and Dr. Pettibone was to have been here to present the case for the full-character printer. Unfortunately for us, Dr. Pettibone was invited to present the keynote address at the American Society for the Preservation of Slide Rule Computing and could not be here.

Dot-matrix printing is an elegantly simple approach to printing. The printed image is formed by nine pins arranged in a vertical row. The mechanism holding these pins is called the print head. As the print head moves horizontally across the page, the appropriate pins are activated, each pin leaving a single dot on the sheet of paper. The dots form the letters you see. While dot-matrix is different from full-character in appearance, I believe it communicates the spirit of tomorrow.

The print you are reading is *horizontally emphasized* dot matrix printing. Rather than a pin being "fired" once per dot, it is fired twice, the second time the head is moved horizontally a very small distance. This line of print appears in unemphasized print. The individual dots are more discernable. It is also possible to use vertically

Since I deemed it more important to attend a meeting in Portland Oregon, I'm sure that my esteemed colleague, Dr. Muller, will take advantage, and feed you all sorts of lies. My intention here is to draw your attention to the "obvious" advantages of a full-character (or daisy-wheel) printer for producing clearly superior appearing text material. Be careful, Doug will try all sorts of devious tricks. My answer to all of that is simple: - just look at the absolutely beautiful, elegant look of this side of the page.

In addition, I can also have a ragged right hand edge, if you want the "hand-typed" look. Generally, I much prefer not to right justify. Some of my students get so excited over the "new" look of justification that they fail to see the "artificiality" of it. But enough of my biases. I can also go back to a fully justified and proportionally printed text using a variety of daisy-wheels (such as those that follow):

For instance, this is my very favorite font for producing documents that look almost "type-set". In fact, one publisher is seriously thinking of going from such computer output to printing plates, without the type-setting operation. I think it looks great! I'm using a carbon ribbon that results in very, very, sharp characters. Just compare it to that smeary mess that Doug calls computer output.

emphasized print. Here the line is printed in regular dot-matrix and then reprinted a very small distance below the first printing. It is possible to combine horizontally and vertically emphasized print. This produces a very dark and strong character. Very useful for emphasizing.

What you can't see, as you read the two columns of this paper, is the cost of the printers or the speed and convenience by which the printing was accomplished. For example, a dot matrix printer, costing about \$700 can print in unemphasized mode at the rate of 160 characters per second. The better full-character printers cost about \$2500 and print 40 to 45 characters per second. A full character printer costing about \$700 will print 15 to 16 characters per second. For the person with little to write and little to do, such slow speed is hardly a matter of concern and would probably never be mentioned. However, when it is realized that I printed my entire half of this handout in less time than it took Dr. Pettibone to print the first page of his portion, the speed advantage of dot-matrix printing is obvious to the productive professional.

Along the same line, the cost of replacing the entire printing mechanism, the print head, of a dot matrix printer is less than the cost of two "daisy wheels" for the full-character printers. Replacing the print head is a do-it-yourself job that takes about 10 minutes. Further, because the dot-matrix printer has only 9 moving parts in its printing mechanism, its reliability is far greater than that of the mechanically complex full-character printer. The dot-matrix printer is clearly superior to the full-character printer in terms of initial investment, speed and maintenance.

Convenience of operation is another advantage that the dot-matrix printer holds over

Notice that his output consists of a bunch of funny looking dots. Try telling me that that doesn't look like computer output. Ugh!! I even have my vita produced using this particular wheel. Let's see who gets hired if Doug and I go after the same job!

Here's an example of another font called "GOTHIC 15". It also looks great compared to Doug's stuff. Just think about it. Do you want to turn-in papers and manuscripts using Doug's dot-matrix (which uses pins [for pinheads, no doubt!]) method, and possibly lose a publishing opportunity? I surely don't! Besides, your documents reflect the kind of person you are. (Are you listening Doug?)

Here's another font (your standard 12 pitch, Elite) that comes out looking very, very good. I don't have full proportional justification with this particular wheel, but it is pseudo-proportional, and it, also looks very good. This looks good enough to be found in a legal brief done by an expensive attorney!

And, here we are back at the normal, 10 pitch, Pica font. Not knowing exactly what Doug will come up with as a counter argument (he's obviously taking advantage of my absence), I'd better fill you in a little about my uses of printers. Yes, I said printers. (Did you notice that I have just about as much flexibility as Doug's cheap dot matrix printer?) One of the very few features that I don't have is DOUBLE-SIZED print. But then, most of my students can read regular sized print! I also am limited to the character-set that is present on my wheels. Doug can generate an entirely new set. For instance, Doug can generate all sorts of statistical formulae. If you find that sort of thing useful, then you should go out and buy a cheap, junky, icky looking dot matrix printer. I

the full-character printer. When Dr. Pettibone changes print size and style, he does it by physically stopping his printer and installing a different "print wheel". This need to change print wheels when one wants to change print styles is a major inconvenience if one is printing 10 copies of a document requiring 10 changes of the wheel. For the individual who is bold enough to break with tradition, the task is simple. The dot-matrix printer will change print styles and sizes in response to coded commands embedded in the material to be printed. For example, I can shift to *italics*, **DOUBLE WIDE**, *Double Wide Italics*, or small letters without stopping my printer. I can change pitch to 16.5, 12, 10, 6, or 5 without stopping.

It is also possible with some dot-matrix printers to define your own characters. Symbols such as the following are rather easily created.

$\Sigma \sigma \beta \alpha \delta \gamma n \bar{m} \bar{s} \bar{x} \approx \pm \checkmark$

I find this capability very useful when preparing statistics notes. For example, the following formulae can be printed using defined characters.

$$\sigma = \sqrt{\frac{n \sum X^2 - (\sum X)^2}{n^2}}$$

$$MS_A = \frac{n \cdot \sum_{j=1}^a (m_{.j} - m_{..})^2}{a - 1}$$

$$\hat{Y} = \mu_0 + \beta_1 \cdot X_1 + \beta_2 \cdot X_2 + \beta_3 \cdot X_3$$

find that when I need to do formulae, that I can do them by hand in spaces I leave using my elegant, sophisticated daisy wheel.

Doug is also big into drawing pictures using his computer. I'm not really into that, but if you are, you should also imitate Doug's lower primate behavior. Doug will also argue that his dot matrix printer is much faster than my daisy wheel. Well, he's correct, but I find no comfort in being able to generate 'crap' faster. Actually, my printer is rated at 40 characters per second, while I believe his will do 80 or 120 CPS. Big deal! Do you want to be famous for printing 'el-junko' 2 or 3 times faster? I surely don't. I won't comment on the substance of what each of us print-out, because that would obviously be taking advantage of a situation that Doug can't help!

I hope that I AM GETTING THROUGH TO YOU! Daisy wheel printers are obviously far superior to dot matrix. I don't want to catch anyone using any of that slipshod "pinhead" nonsense!!!

Just in case Doug tries to tell you that I can't get sub or super scripts, here are a few to "ooh and aah" at!

Water is known as H_2O

and everyone knows that

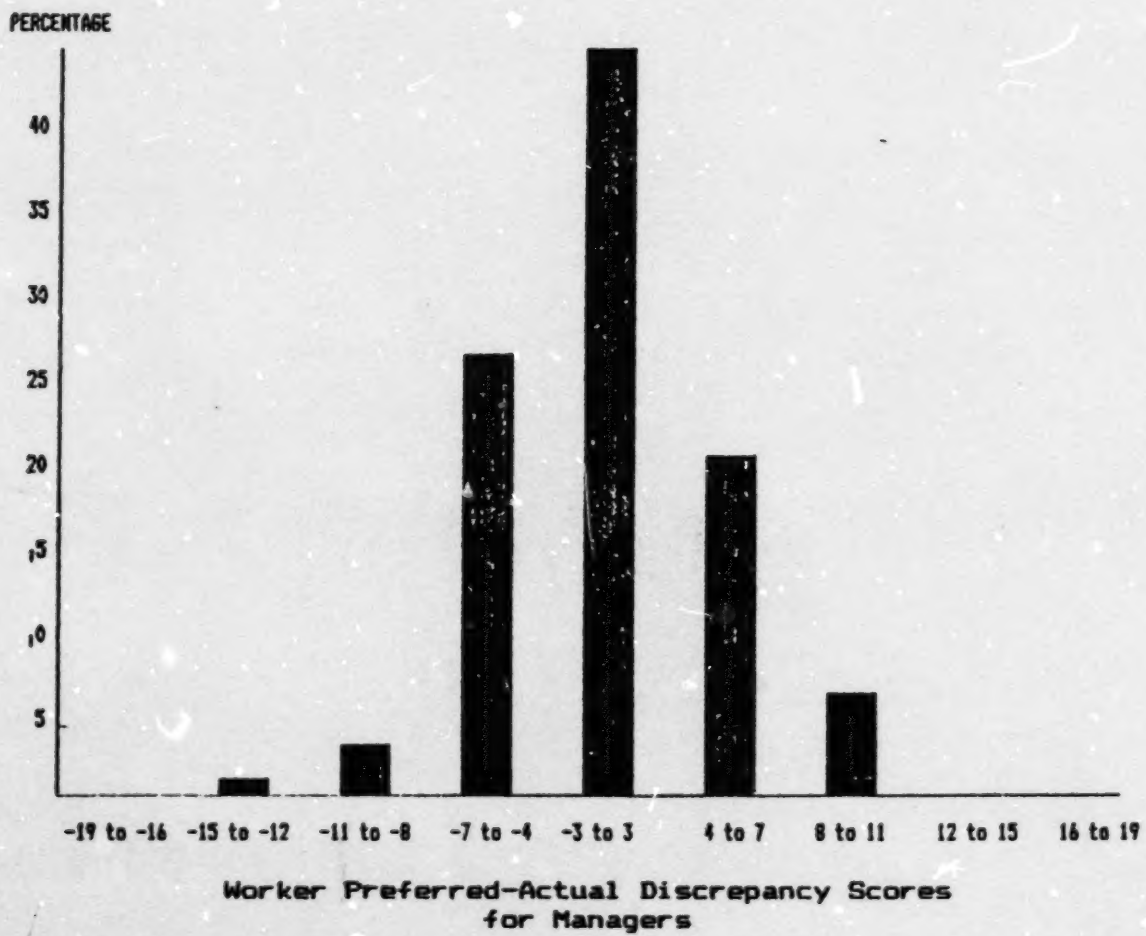
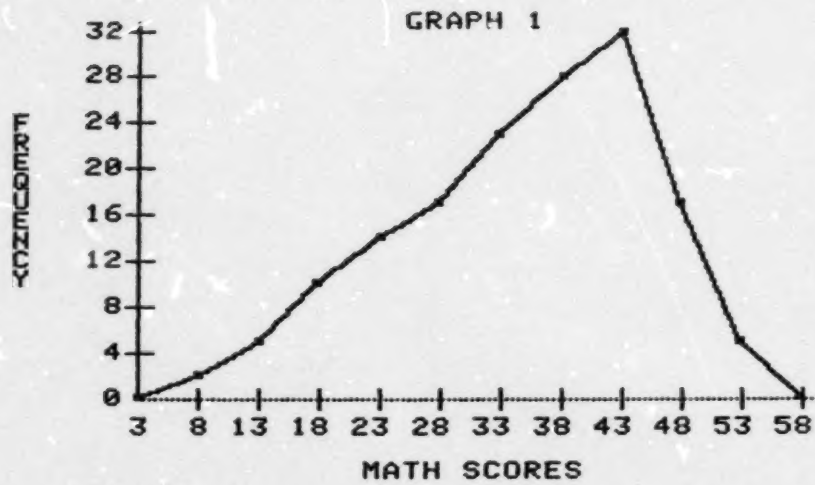
$$x^2 + y^2 = z^2$$

Well, now that we have put down daisy wheel and dot matrix printers (and we did extraordinarily good jobs of doing just that), it's time to come to grips with the "real scoop" regarding these situations.

BOTH OF US HAVE BOTH DOT MATRIX AND DAISY WHEEL PRINTERS! And, we wouldn't want to give up either. If pushed to the wall, Pettibone might give up his dot matrix, and Muller might give up his daisy wheel, but only because they know that they could borrow each others. Both of us worked as a subcommittee (with others in the college) to obtain Graduate School approval for using dot matrix printer output for final drafts of theses and dissertations. After overcoming pockets of resistance (some are still there, by the way), we developed a recommended policy adopted by the College of Education (see attached). As you can see, certain stipulations had to be made, including the fact that every committee member has to approve such use. In some instances, that approval is not forthcoming, and the student must either find an available daisy wheel printer, or resort to hand typing. Suprisingly, the Graduate School was receptive to our recommendations. We did this because we felt that the widespread use of dot-matrix printers and graduate student cost factors indicated such a need. (Besides, Pettibone doesn't want students to wear-out his printer).

Also note that the dot matrix printer output has to be of high quality, using a nice, dark ribbon. Double-strike is required, as is an intelligent use of hyphenation techniques.

All in all, we are both pleased with both of our printers. Each serves an important and useful purpose in our professional lives. If you are not rich like us, and must choose one over the other, let your needs determine that decision. Cost differences are no longer 5 or 6 to 1. They may be down to 2 to 1. If you shop carefully, a high quality dot matrix printer can be obtained for around \$250-300 and, likewise, a sturdy daisy wheel can be had for around \$550-600. This price differential is bound to decrease as the technology gets better and better. Good luck to you in your endeavor to get more out of the computer than you put in. Both of us feel that we have (with both types of printers).



GUIDELINES FOR THE USE OF DOT-MATRIX PRINTERS
IN THE PREPARATION OF DISSERTATIONS AND THESES

College of Education
New Mexico State University

While the College of Education and the Graduate School permit the use of dot-matrix printers to prepare the final draft of the dissertation or thesis, the student who plans to use such a printer must realize that some dot-matrix printers are not capable of producing a document of acceptable quality. Further, the student must realize that it is the prerogative of his/her department, dissertation/thesis chairman or committee to prohibit the use of the dot-matrix printer.

The following guidelines represent minimum acceptable standards as adopted by the College of Education. More rigorous standards may be adopted by any of the various departments of the college. Further, the student's dissertation/thesis chairperson or committee may also impose additional or more rigorous standards.

1. *Letters must have descenders.* The bottom portion of the lower case letters "j", "g", "p", "q" and "y" must descend below the line of print.
2. *Dot-matrix must be a minimum of 9 x 7.* The matrix of dots which define the letters must contain a minimum of 9 vertical dots and 7 horizontal dots.
3. *Print size must be standard.* The size of print in the text must be between 10 and 12 characters per inch with six lines of print per inch. Size of print and line spacing in large tables may be compressed if it enhances the clarity of presentation.
4. *Print must be enhanced dot-matrix.* The print must not be simple dot-matrix in which each dot is the product of a single strike of the print-head pin. Rather, each dot must represent at least two strikes of the print-head pin and the position of subsequent strikes of the same pin must overlap but not perfectly coincide. Exceptions to this may be granted on an individual basis when a printer of extraordinary quality is being used.
5. *Intensity and uniformity of print.* The print must be uniformly black throughout the document. Print of a gray tone from an exhausted ribbon will not be acceptable.
6. *Hand inserted symbols must be minimized.* Virtually all the characters appearing in the text must be printed on the printer. Underlining, "<", ">", "<_", ">_", and superscripting must be printed by the dot-matrix printer. The dot-matrix printer must be capable of printing as much of the text as is the standard office typewriter.

7. *Italics may be substituted for underlining.* When underlining is used to signify italics, then the text may be printed in italics rather than using underlining. Such a substitution must be consistently employed throughout the dissertation or thesis.
8. *Hyphenation should be used.* Hyphenation should be used to achieve a more even appearance on the right margin of the text. Standard rules of hyphenation apply. However, the student's committee may permit the student to not use hyphenation.
9. *Justification of both margins is permissible.* The text may be justified on both the right and left margins if the student's committee approves.
10. *Standard rules of format apply.* All standard rules of format apply to text produced on a dot-matrix printer. These rules must not be compromised to accommodate limitations in the capabilities of a specific printer.
11. *Approval of committee.* If the student is anticipating using a dot-matrix printer for the final copy of the dissertation or thesis, he must have the signed approval of the entire doctoral, education specialist or masters committee. Normally this approval would come at the time of the proposal defense but in all cases, it must be obtained prior to the final defense. The request for approval must be accompanied by a fairly extensive sample of text. This sample should demonstrate how such things as underlining, justification, symbols, pagination, etc., are going to be accomplished. A request for exemption from established guidelines must also be made at this time. Use of the dot-matrix printer for preparation of the final draft must not be assumed by the student to be a matter of course.
12. *Graduate School Approval.* The student assumes the responsibility for insuring that the final draft of the dissertation or thesis is consistent with graduate school standards.

Approved by the College Council on March 5, 1982.

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